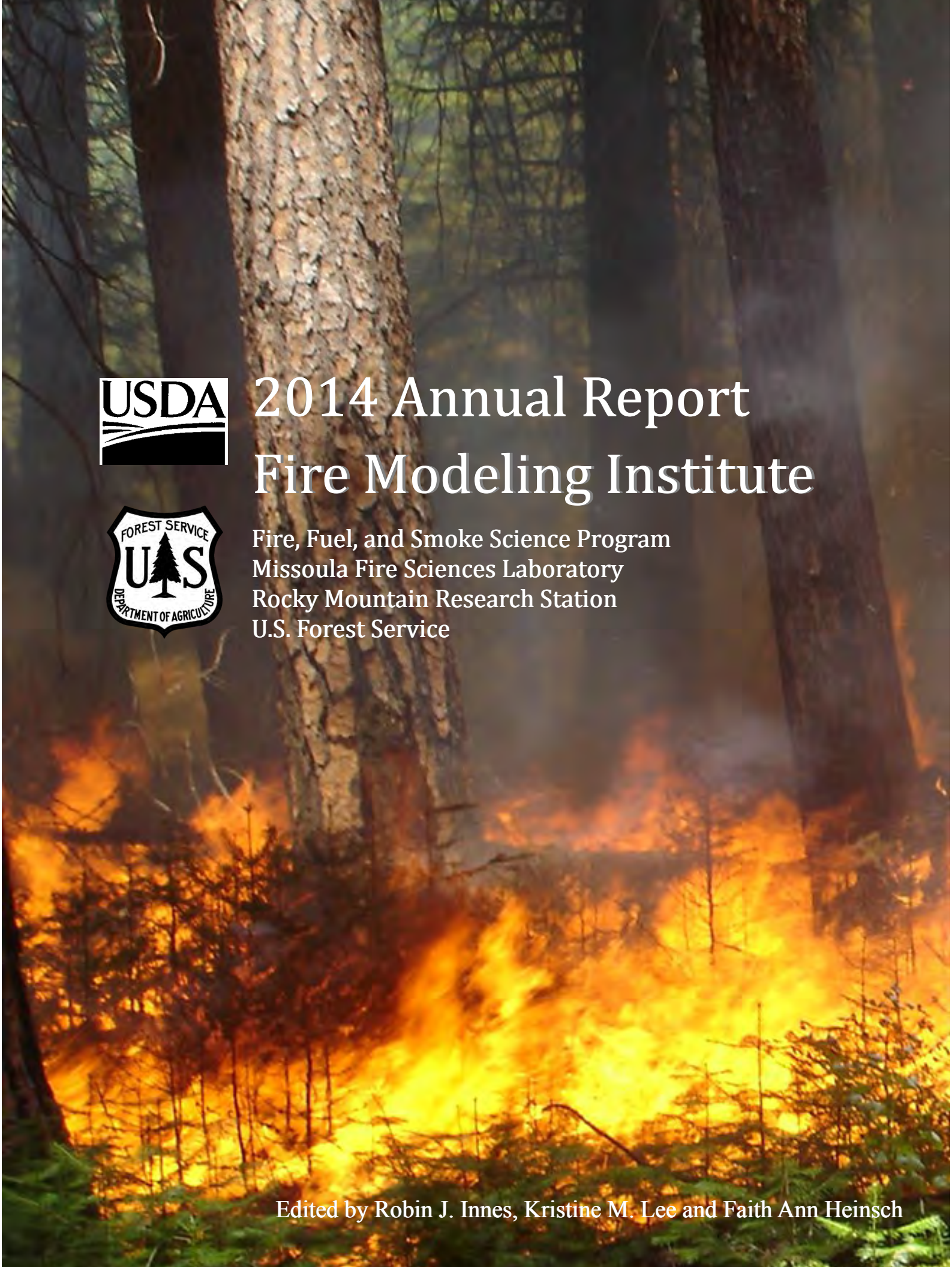

2014 Annual Report
Fire Modeling Institute

Fire, Fuel, and Smoke Science Program
Missoula Fire Sciences Laboratory
Rocky Mountain Research Station
U.S. Forest Service

Edited by Robin J. Innes, Kristine M. Lee and Faith Ann Heinsch

If you have questions about this report or the
Fire Modeling Institute, please contact us.

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Citation: Innes, Robin J.; Heinsch, Faith Ann; Lee, Kristine M., editors. 2015. Fire Modeling Institute 2014 Annual Report: Unpublished report on file at: Missoula, MT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. 32 p.

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Introduction

Fire Modeling Institute: 2014 Year in Review

The Fire Modeling Institute (FMI), located at the Missoula Fire Sciences Laboratory (Fire Lab) in Montana, is a joint effort between the Fire, Fuel, and Smoke Science Program (FFS) of the Rocky Mountain Research Station (RMRS) and Washington Office Fire and Aviation Management (WO F&AM). FMI was chartered to create an organization and work force to support, maintain, and develop collaborations between U.S. Forest Service Research and Development and fire managers in the field.

FMI's mission is to connect fire managers, technical experts, and scientists with the best fire analysis technology and with the most current information from the scientific literature available to respond to their fire-related resource management needs. Tasks supported by FMI include:

- **development and application** of the latest technology and information to address fire management issues,
- **maintenance and enhancement** of existing FFS products,
- **support** for management in the application of fire science, and
- **training and education** to improve fire science application and communication with the public about fire management.

In 2014, FMI staff developed data products to facilitate fire-planning activities and helped land managers throughout the nation develop risk assessments, forest plans, and fuels treatment plans. They also contributed to advancement of burn severity research, helped develop datasets and methodology for conducting quantitative assessments of wildfire risk across large landscapes, and performed analyses to support national-scale strategic fuels management on U.S. Forest Service lands.

FMI staff maintain and enhance FFS applications and products, including BehavePlus, FEAT-FIREMON Integrated (FFI), the Fire Effects Information System (FEIS), the Weather Information Management System (WIMS), the Wildland Fire Assessment System (WFAS), and many others. FMI is always striving to improve these applications and products. For example, this year, the Information Team provided many new and updated products in FEIS and continued to work with the U.S. Forest Service Digital Visions Enterprise Team, FMI-LANDFIRE, and The Nature Conservancy-LANDFIRE to develop an improved

Figure: FMI is a bridge between scientists and managers that directly applies science to fire and resource management problems .

user interface for FEIS that will be released in 2015. In addition, the release of BehavePlus 6, FireFamilyPlus 4.2, FOFEM 6.3, and the next version of FuelCalc are expected in 2015 and the new U.S. National Fire Danger Rating System (NFDRS) is expected in 2016.

Each year, FMI staff provide support services for users of FFS applications and products, and in 2014, they reported more than 350 technical support contacts regarding their operation. FMI staff also provide field support during wildfire incidents. In 2014, FMI staff worked nearly 880 hours providing fuels and fire behavior modeling, operations, and planning support to fire managers throughout the West.

Training and educational course development in support of interagency fire managers is an important task of FMI. FMI staff provide instruction on the use of FFS applications and products and instruct many National Wildfire Coordinating Group courses. They are also instrumental in the Fire Lab's Conservation Education Program, reaching more than 1,000 students and 150 adults in 2014 alone.

The staff at FMI work with a range of national and international partners, including other agencies, state and local governments, academia, and nonprofit groups to accomplish these tasks. For example, they worked with officers from the Zambia Wildlife Authority and Zambia Forestry Department to document fire use by villagers throughout the Eastern Province of Zambia to provide a fire regime assessment for the province. In another project, they worked with the U.S. Fish and Wildlife Service, Coronado National Forest, and Fort Huachuca, a military installation in Arizona, to provide a 10-year fuels treatment and implementation plan. The plan is intended to produce forest structure and fuel characteristics that reduce the likelihood that future wildfires will cause large, rapid changes in biophysical conditions in and around Mexican spotted owl activity centers.

This issue of FMI's Annual Report summarizes the results of activities by task for 2014. Information about FMI projects, data products, and applications can be accessed at http://www.firelab.org/fmi.

Figure: The Fire Modeling Institute (FMI) is located at the Missoula Fire Sciences Laboratory in Montana.

Development and Application

The Fire Modeling Institute continues to assist managers in developing and applying the latest science and technology to address fire management issues. FMI staff collaborates with managers at all levels—local through national—to apply state-of-the-art modeling, spatial analysis, and data analysis to fire management.

Application of the Wildfire Risk Assessment Framework

Since 2010, researchers with the RMRS Fire, Fuel, and Smoke Science Program and the Human Dimensions Science Program have developed the datasets and methodology for conducting quantitative assessments of wildfire risk across large landscapes, in collaboration with analysts from the Pacific Northwest Research Station's Western Wildlands Environmental Threat Assessment Center and elsewhere. After several years of development, modeling, and case studies at spatial scales from the entire conterminous United States (CONUS) down to local National Forest units, RMRS published a General Technical Report in 2013 titled "A Wildfire Risk Assessment Framework for Land and Resource Management" (RMRS-GTR-315). This GTR clearly laid out the components necessary to evaluate wildfire risk to specific highly valued resources and assets (HVRAs) and outlined a repeatable, scalable framework by which to do so.

In 2014, analysts with FMI engaged in the process of beginning to transition the risk assessment framework from research and development to application at various spatial scales.

At the national scale, Spatial Fire Analyst Greg Dillon began work on an assessment of wildfire risk across all National Forest System lands that Washington Office Fire and Aviation Management staff plan to use to guide fuels management priorities and budget allocations among U.S. Forest Service regions. In 2014, Dillon identified national-level HVRAs, acquired and processed spatial data for all HVRAs, worked with RMRS researchers and regional fuels specialists and fire ecologists to articulate each HVRA's likely response to wildfire, and engaged the Sustainable Land Management Board of Directors (SLMBOD) in assigning relative priorities to the HVRAs.

At the regional scale, GIS Specialist Eva Karau assisted RMRS researchers and Southwest Region (Region 3) employees with a risk assessment for that region. Karau attended a workshop at the Region 3 Regional Office in Albuquerque, New Mexico to help elicit information from resource specialists from throughout the region on the response of HVRAs to wildfire. She has also helped Region 3 to process spatial datasets and work through the process of calculating quantitative measures of risk.

At the local scale, Spatial Fire Analyst LaWen Hollingsworth, along with Dillon and Karau, are working with fire management staff from the Lolo National Forest and Bitterroot National Forest to guide them as they begin risk assessment efforts on both forests.

Contact: Greg Dillon
FMI Staff: Greg Dillon, Eva Karau, LaWen Hollingsworth
Collaborators: RMRS Human Dimensions and Fire, Fuel, and Smoke Science Programs, Pyrologix LLC, Washington Office Fire and Aviation Management, U.S. Forest Service Southwest Regional Office, Lolo National Forest, Bitterroot National Forest
Status: Ongoing

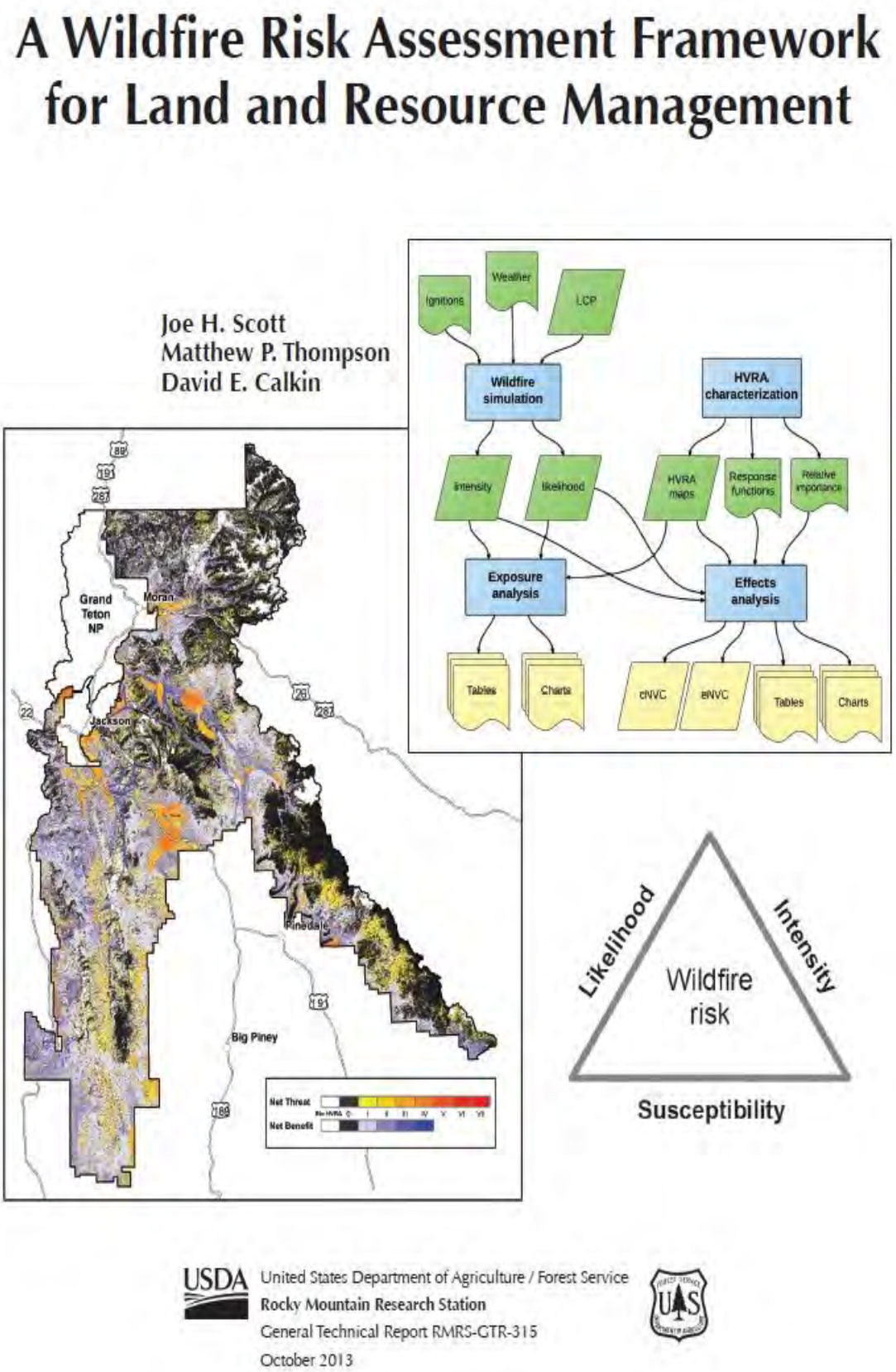


Figure: The "A Wildfire Risk Assessment Framework for Land and Resource Management" general technical report was published by RMRS in 2013. The report lays out the components necessary to evaluate wildfire risk to specific highly valued resources and assets and outlined a repeatable, scalable framework by which to do so.

Development and Application

Burn Severity Assessment

The magnitude of ecological change caused by wildfires, commonly referred to as fire severity or burn severity, has been the subject of much research recently. Scientists are interested in understanding the conditions that lead to different degrees of severity across landscapes in order to better inform managers in the full spectrum of wildfire management decisions from strategic planning before and during fires to post-fire mitigation and recovery. In 2014, FMI analysts contributed to advancement of, and communication about, burn severity research through continuation of collaborations formed in recent years with scientists from RMRS, the Northern Region of the U.S. Forest Service, and the University of Idaho.

Publications about fire severity and burn severity in 2014 that included FMI analysts as authors included:

- Karau, Eva C.; Sikkink, Pamela G.; Keane, Robert E.; and Dillon, Gregory K. 2014. Integrating satellite imagery with simulation modeling to improve burn severity mapping. Environmental Management 54(1): 98-111. Available: http://www.treesearch.fs.fed.us/pubs/47013
- Keane, Robert E.; Dillon, Greg; Drury, Stacy; Innes, Robin; Morgan, Penny; Lutes, Duncan; Prichard, Susan J.; Smith, Jane; Strand, Eva. 2014. New and revised fire effects tools for fire management. Fire Management Today 73(3): 37-47. Available:

Figure: Lodgepole pine seedlings one year after the 2009 Kootenai Creek Fire. Photo courtesy of Greg Dillon.

http://www.treesearch.fs.fed.us/pubs/46779

- Morgan, Penelope; Keane, Robert E.; Dillon, Gregory K.; Jain, Theresa B.; Hudak, Andrew T.; Karau, Eva C.; Sikkink, Pamela G.; Holden, Zachary A.; Strand, Eva K. 2014. Challenges of assessing fire and burn severity using field measures, remote sensing and modelling. International Journal of Wildland Fire 23(8): 1045–1060. Available: http://www.publish.csiro.au/nid/114/paper/WF13058.htm
- Parks, Sean A.; Dillon, Gregory K.; Miller, Carol. 2014. A new metric for quantifying burn severity: The relativized burn ratio. Remote Sensing 6(3): 1827-1844. Available: http://www.treesearch.fs.fed.us/pubs/46610

In addition, FMI Spatial Fire Analyst Greg Dillon presented information on burn severity research to visitors of the Missoula Fire Sciences Lab, including Northern Rockies interagency incident management teams and students from the University of Montana.

Contact: Greg Dillon
FMI Staff: Greg Dillon, Eva Karau
Collaborators: Bob Keane (FFS), Sean Parks (RMRS, Aldo Leopold Wilderness Research Center), Penny Morgan (University of Idaho), and others
Status: Ongoing

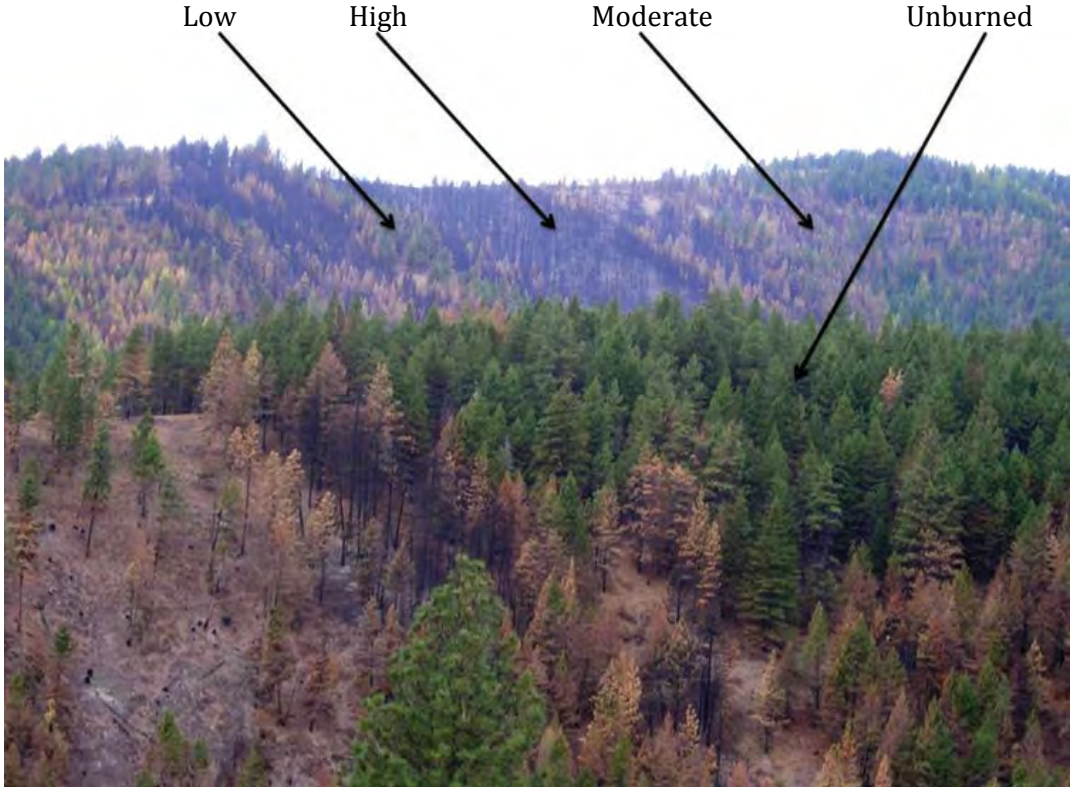


Figure: Post-fire landscape near the lightning ignition start of the 2003 Black Mountain 2 fire near Missoula, Montana, 8 weeks after burning. The heterogeneous pattern of fire severity patches is a result of the interactions of fire with the biotic and physical environment at multiple scales. Photo courtesy of Andy Hudak, Moscow Forestry Sciences Laboratory.

Development and Application

Fort Huachuca 10-Year Fuels Treatment and Implementation Plan

Within the Fort Huachuca military installation in southeastern Arizona, there are eleven Protected Activity Centers (PACs) identified for the threatened Mexican spotted owl. The PACs include a variety of vegetation types including multi-storied conifer and pine-oak systems in addition to grasslands. These PACs provide nesting and roosting habitat as well as foraging habitat for the Mexican spotted owl both within the PAC and in adjacent areas. A wildfire has the potential to alter multi-storied structure within the PACs, resulting in unknown consequences to the Mexican spotted owl.

The objective of this project was to develop a fuels treatment plan, based on landscape fire simulations, that allows Fort Huachuca to treat minimum area for maximum benefit and produce forest structure and fuel characteristics that reduce the likelihood that future wildfires will cause large, rapid changes in biophysical conditions in and around designated PACs, while still maintaining habitat for all other threatened and endangered species and their prey. Approximately 6,014 acres (2,434 ha) within Fort Huachuca have been grouped into nine treatment units based on a desire to modify fire behavior in these units because they are adjacent to PACs. Most units are proposed for mechanical thinning followed by prescribed fire as this combination of silvicultural treatments offers the best combination of removing ladder fuels, increasing canopy gaps where appropriate, and decreasing fine woody debris. Two additional units were identified west of Fort Huachuca on the Coronado National Forest as numerous PACs in Fort Huachuca lie near this ownership boundary.

Contact: LaWen Hollingsworth
Collaborators: Tim Wallace (FFS), Debbie Brewer (Fort Huachuca), Shaula Hedwall (U.S. Fish and Wildlife Service), Kendal Wilson (Coronado National Forest)
Status: Complete

Figure: Mexican spotted owls within Fort Huachuca. Photo courtesy of Steve Howe.

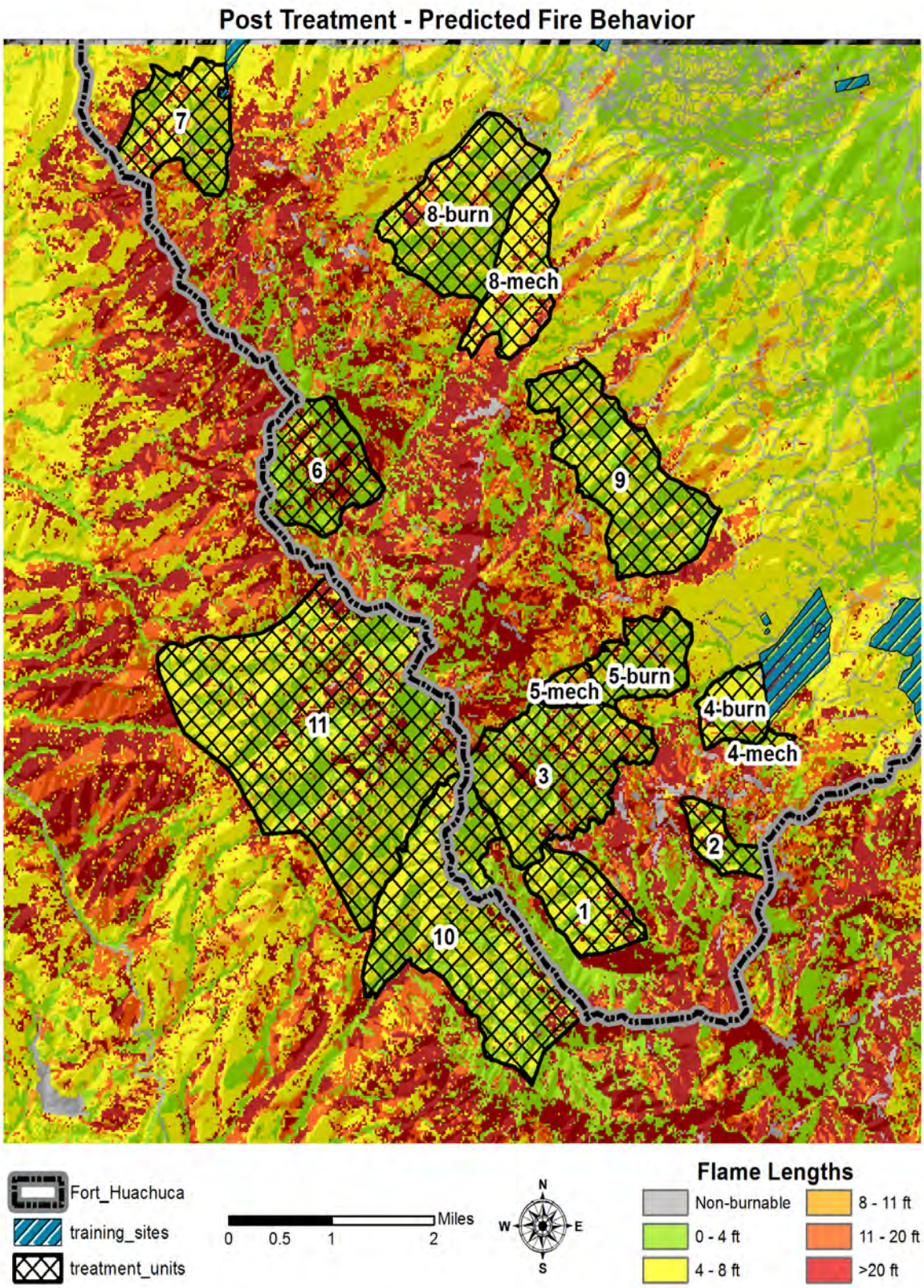


Figure: Predicted fire behavior following proposed treatments within Fort Huachuca. Flame lengths were derived from FlamMap as predicted for dry conditions and southwest winds.

Development and Application

LANDFIRE 2012 Data Product Update and Initiation of Planning for the LANDFIRE ReMap

LANDFIRE, also known as Landscape Fire and Resource Management Planning Tools, is a joint program between the wildland fire management programs of the U.S. Forest Service and the U.S. Department of the Interior. LANDFIRE applies consistent methodologies and processes to create comprehensive spatial data and models describing vegetation as well as wildland fire and fuel characteristics across the entire United States. LANDFIRE data products facilitate national, regional, and large landscape-level fire planning activities and provide managers with data needed for fire planning and implementation using a collaborative, cross-boundary, interagency approach.

In 2014, FMI-LANDFIRE staff continued to develop and update vegetation and fuel data for the LANDFIRE 2012 products currently being released (http://www.landfire.gov). This latest update effort in the Coterminous United States included 1) updating of agricultural lands with 2012 Cropland Data Layer data; 2) revising shrub and herbaceous cover and height data, including National Land Cover Database (2011) urban data, to account for urban expansion; 3) theme refinements in mapping ruderal fuel on U.S. Fish and Wildlife Service lands; and 4) delivery of the new Transition Magnitude geospatial product and associated databases. Work continues on Alaska with a new tree cover layer nearly completed and updates to the Puerto Rico and U.S. Virgin Islands fuel layers.

In addition, scoping for comprehensive decadal remapping in order to capture gradual, cumulative, and broad-scale changes for the entire LANDFIRE mapping area has begun. In order to fully evaluate the various elements pertinent to remapping, FMI-LANDFIRE staff conducted three after-action reviews and scoping sessions to collect input that affects the scale and approach to this effort. The objective of these sessions is to evaluate past, current, and potential future approaches toward three elements of the LANDFIRE products: requirements, production methods, and applications.

In addition, FMI-LANDFIRE staff helped LANDFIRE celebrate it's 10-year anniversary at the Large Fire Conference in Missoula, Montana, by serving cake to conference attendees.

Contact: Frank Fay (Washington Office Fire and Aviation Management)
FMI Staff: Don Long
Collaborators: Washington Office Fire and Aviation Management, U.S. Department of the Interior
Status: Ongoing

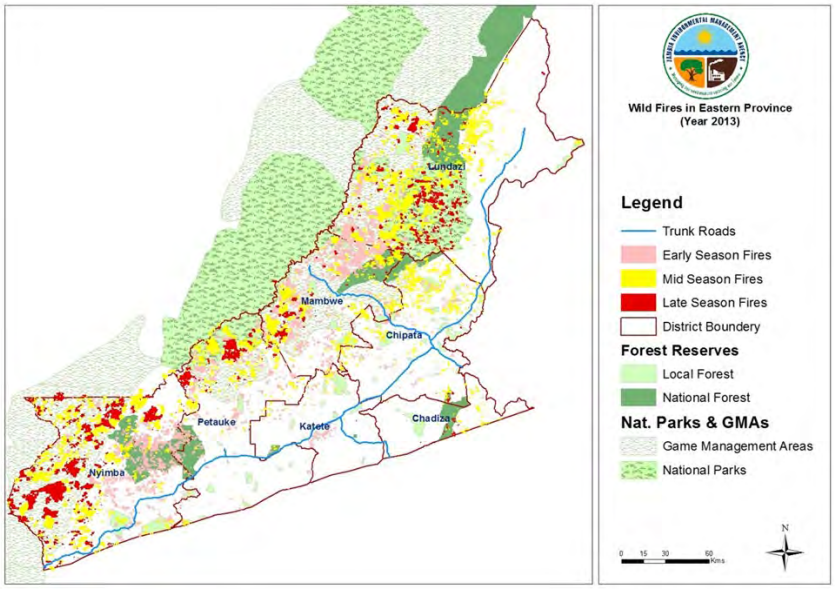
Figure: Celebrating LANDFIRE's ten-year anniversary at the Large Fire Conference in Missoula, Montana, in May. Photo courtesy of Jeannie Patton of The Nature Conservancy.

Living with Fire: A Fire Regime Assessment of the Eastern Province, Zambia

A team of four individuals, supported through the U.S. Forest Service International Programs, convened in October 2014 to conduct a fire regime assessment in the Eastern Province of Zambia. The team, which included a multinational assemblage from the United States and Zambia, was tasked with the following objectives: 1) gain preliminary insights into the current status of fire management and fire use in the province, 2) assess the role of fire in the regeneration and maintenance of the dominant vegetation present in the terrestrial ecosystems of the province, and 3) provide recommendations for fire management training and equipment needs for the Zambia Forestry Department and partner agencies.

The Eastern Province, and Zambia by extension, is dominated by vast tracks of fire-prone vegetation including woodland savannas and grasslands. Bush fire is a frequent process on the landscape, estimated to annually burn approximately 25% of Zambia's land base. Fire is a readily available and inexpensive tool that impoverished rural populations in Zambia can utilize to participate in a multitude of traditional activities such as clearing vegetation for agriculture, improving pastures for grazing, burning crop residues, hunting, and stimulating the growth of non-timber forest products. The presence of fire-adapted plants and paleoecological studies indicate that fire has been used by humans in this landscape for millennia (and as such is culturally ingrained) and has helped to shape much of the existing Zambian landscape. Fire is used as a tool by the Zambian people throughout the dry season, but the effects can be more substantial late in the dry season when herbaceous fuels are fully cured and fires can quickly spread into adjacent villages or protected areas.

The team travelled 1,550 miles (2,500 km) throughout the Eastern Province to meet with officers from the Zambia Wildlife Authority (ZAWA) and Zambia Forestry Department (ZFD) who manage protected areas including national parks, game management areas, national forests, and local forests. The team also met with village leaders and community members throughout the Eastern Province to document the use of fire by villagers. The team also met with various ministry and government officials in Lusaka, the capital.



It is essential that contemporary fire management strategies, if they are to be effective, consider not only the technical aspects of fire management but also the communities and the environment in which they live. The team will provide a list of recommendations in the technical report, due to be released in January 2015, that will highlight future formal fire management training needs for ZAWA and ZFD personnel and promote development of community-based fire management plans,

Figure: Seasonality and aerial extent of fires in the Eastern Province of Zambia as detected by MODIS Active Fire Data .

Development and Application

increased establishment of community tree nurseries, and improved outreach to communities that lessen social and ecological effects of fire.

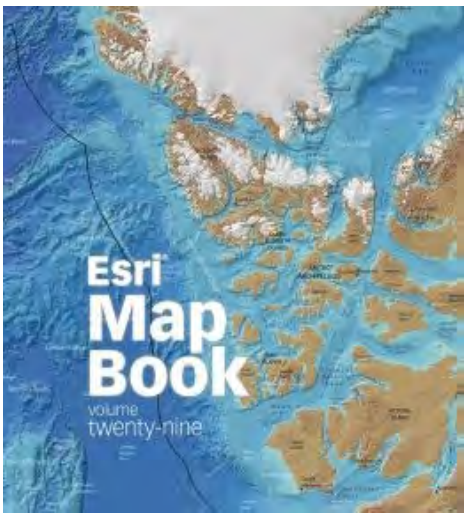
Contact: LaWen Hollingsworth
Team Members: Darren Johnson (U.S. Forest Service International Programs), Sylvester Siame (Zambia Forestry Department), Gift Sikaundi (Zambia Environmental Management Agency)
Status: In progress

Figure: The team travelled throughout the Eastern Province of Zambia , meeting with village leaders and community members to document their use of fire. This photo shows a meeting with members of the Chisadzi Village in the Chadiza District. Photo by LaWen Hollingsworth.

Wildland Fire Potential Map

The Wildland Fire Potential (WFP) map combines probabilistic estimates of wildfire likelihood and intensity developed by RMRS scientists into an easily interpretable five-category index ranging from very low to very high fire potential. An FMI spatial fire analyst developed the WFP map and maintains a website where users can download GIS data, map graphics, and supporting documentation (http://www.firelab.org/project/wildland-fire-potential).

In 2014, FMI performed analyses with the WFP map to support national-scale strategic fuels management on U.S. Forest Service lands. In addition, FMI provided guidance to managers and analysts with the Department of the Interior Office of Wildland Fire, as well as the Bureau of Indian Affairs, on how to best adapt and use the WFP map on their lands.



To support national-scale fuels management within the U.S. Forest Service, FMI conducted an overlay analysis across all National Forest System lands with the WFP and spatial data depicting different management concerns, such as proximity to residentially developed areas and high value watersheds for supplying municipal drinking water. The Washington Office Fire and Aviation Management used results from this analysis in a report to the White House Office of Management and Budget to show how the U.S. Forest Service is pursuing risk-based identification of priority fuel treatment areas. The WFP map and summary data were also included in briefing materials prepared by U.S. Forest Service leadership and presented by USDA Secretary Vilsack in a video teleconference with President Obama and the Western Governors Association.

Throughout 2014, the WFP map continued to receive broad public exposure through the WFP website and other venues. Notable examples include the following:

- Greg Dillon presented a talk covering the WFP mapping methods and the national analysis for the U.S. Forest Service at the Large Wildland Fires conference in Missoula, Montana.
- Map graphics and a short write-up on the WFP were published in the ESRI Map Book Volume 29, produced by the Environmental Systems Research Institute (makers of ArcGIS software).
- Editors of USAA Magazine, produced by USAA Insurance for its members, used summary data from the WFP map to produce an infographic of states at risk for wildfires in their fall 2014 issue.

Contact: Greg Dillon
Collaborators: Elizabeth Reinhardt, Jim Menakis, Frank Fay (Washington Office Fire and Aviation Management)
Status: Ongoing

Figure: The Wildland Fire Potential map was published in the Esri Map Book, Volume 29, produced by the Environmental Systems Research Institute .

Maintenance and Enhancement

The Fire Modeling Institute maintains and enhances numerous FFS products, including the BehavePlus fire modeling system, FIREMON Integrated (FFI), the Fire Effects Information System (FEIS), and many other products. This ensures that the latest technology is available to users of these products.

BehavePlus

The BehavePlus fire modeling system is a nationally supported desktop application that models fire behavior, fire effects, and aspects of the fire environment. BehavePlus is used to model surface and crown fire spread rate and intensity, transition from surface to crown fire, fire size, effect of containment efforts, tree scorch height and mortality, fuel moisture, wind adjustment factor, spotting distance, and more.

BehavePlus is not limited to a specific application, but rather is designed to be used for any fire management application for which fire model results are useful. It is used by federal, state, and local land management agencies, universities, consultants, and others, both nationally and internationally. Outputs from BehavePlus are used for a range of applications including wildfire prediction, prescribed fire planning, and fuel hazard assessment, as well as communication, education, and training.

BehavePlus is currently being updated to include more than 20 new and improved features, including new analysis variables and special case fuel models. Release of version 6 is expected in summer 2015.

Contact: Faith Ann Heinsch
FMI Staff: Pat Andrews (retired), Faith Ann Heinsch, LaWen Hollingsworth
Contract Programmers: Systems for Environmental Management; RTL Networks, Inc.
Status: Ongoing

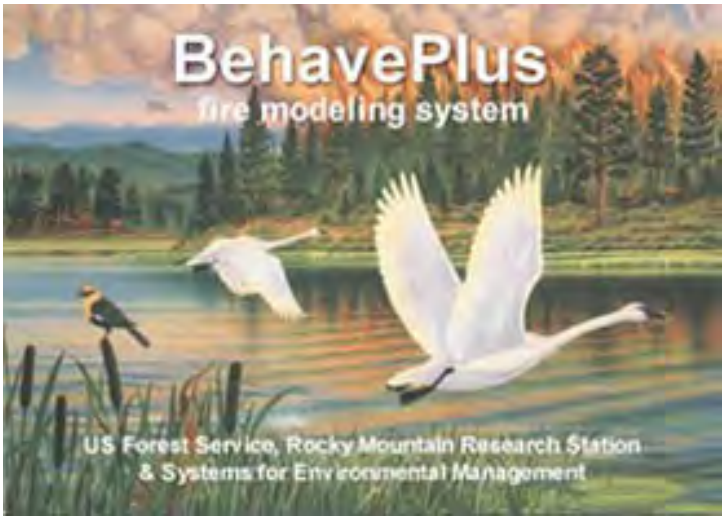


Figure: BehavePlus fire modeling system logo, including trumpeter swans taking refuge in the air as a threatening wildfire rages through the forest habitat. The logo is taken from the painting "WILDFIRE" by Monte Dolack and used with permission of the artist.

FEAT-FIREMON Integrated (FFI)

FEAT-FIREMON Integrated (FFI) is an interagency, science-based, ecological monitoring software application that is designed to assist managers in meeting monitoring requirements as mandated by Federal law. It is used in the U.S. Forest Service (USFS), National Park Service (NPS), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), U. S. Geological Survey (USGS), and Bureau of Indian Affairs (BIA), and by tribes, state and local governments, nongovernmental organizations, and universities.

FFI is a robust ecological, vegetation and fuels monitoring tool used to consistently describe ecological systems and monitor change over time. It incorporates the components necessary to conduct a successful monitoring program, including an integral database, analysis and reporting tools, and modular GIS component.

In May 2014, the FFI development team released FFI v1.05.00. Changes include modified reports, updated Forest Vegetation simulator file export utility, import/export improvements, protocol updates, bug fixes, and user requested updates.

The initial version of FFI-Lite was also released in May. FFI-Lite is a more compact installation of FFI and is designed to be used on field computers and by users that do not need the full functionality of SQL Server.

The next release of FFI and FFI-Lite will include an updated copy of the Natural Resources Conservation Service PLANTS database and further refinement of the import/export utility. FFI will also include a new global species replacement tool to simplify updating species symbol codes.

In a May 2014 survey, 90% of respondents said they were highly satisfied or satisfied with the FFI software and 96% said FFI helped them support their agency's mission. The FFI technical support lead for FMI recorded >100 technical support contacts in 2014.

Contact: Duncan Lutes
Collaborators: National Park Service, Systems for Environmental Management, Axiom IT Solutions
Status: Ongoing

Figure: Estimating understory cover within a 1-meter quadrat during a FEAT-FIREMON Integrated (FFI) training course. Photo courtesy of Nikole Swaney, The Nature Conservancy.

Maintenance and Enhancement

Fire Effects Information System (FEIS) Updates

The Fire Effects Information System (FEIS, http://www.feis-crs.org/beta/) provides scientific information for resource management, restoration, rehabilitation, and fire management. In 2014, FEIS continued to improve its service to managers with new and updated products and a new user interface under development.

FEIS is producing a collection of new literature reviews called Fire Regime Syntheses. These syntheses supplement information in FEIS Species Reviews and complement fire regime products developed by LANDFIRE. Each Fire Regime Synthesis covers a group of Biophysical Settings, the vegetation units used by LANDFIRE that represent vegetation that may have been dominant on the landscape prior to Euro-American settlement. By bringing information together from the scientific literature and LANDFIRE's Biophysical Settings models, FEIS's Fire Regime Syntheses provide up-to-date information on the characteristics of historical fire regimes as well as contemporary changes in fuels and fire regimes, and enable LANDFIRE to incorporate the latest science into their data revisions. These syntheses also identify regions and plant community types with little or no fire history data. Three Fire Regime Syntheses were added to FEIS in 2014. Each synthesis is linked to related FEIS Species Reviews.

FEIS also continues to provide online syntheses of scientific knowledge on more than 1,100 species of plants and animals in the United States and their relationships with fire. Five Species Reviews were updated in 2014. Notable among these are reviews covering black spruce, common manzanita, and tussock cottongrass.

In 2014, FEIS had 555,521 visitors from more than 50 countries and all of the United States, with most visits from California, Texas, Washington, Oregon, and New York. Of the reviews available in FEIS, 99.3% received a visit in 2014. Sixteen of the 40 most commonly viewed syntheses covered invasive plants, while 5 of the 40 most frequently viewed syntheses covered mammals (mule deer, white-tailed deer, elk, moose, and coyote).

Figure: Tussock cottongrass grows from postfire nutrient-rich soils in Gates of the Arctic National Park. A Species Review of tussock cottongrass was published in 2014. Photo courtesy of the National Park Service.

The Information Team continued to work with the U.S. Forest Service Digital Visions Enterprise Team, FMI-LANDFIRE, and TNC-LANDFIRE to develop an improved user interface for FEIS. The improvements will make fire regime information accessible for ~1,100 FEIS Species Reviews and for ~2,500 LANDFIRE Biophysical Settings. It will be implemented in 2015.

Contact: Jane Kapler Smith
FMI Staff: Ilana Abrahamson, Janet Fryer, Robin Innes, Jane Kapler Smith, Kris Zouhar
Collaborators: U.S. Department of the Interior, National Wildfire Coordinating Group's Fuels Management Committee, FMI-LANDFIRE, The Nature Conservancy-LANDFIRE, National Center for Landscape Fire Analysis
Status: Ongoing

Figure: Crowning fire in a black spruce stand during the lightning-ignited, 2004 Taylor Complex Wildfire in southeastern interior Alaska. A Fire Regime Synthesis of Alaskan black spruce communities was published in 2014. Photo used with permission of Wildlandfire.com.

Maintenance and Enhancement

FireFamilyPlus

FireFamilyPlus (FFP) is an agency-independent desktop application. It supports the spectrum of analysis tools required by fire managers to successfully use the U.S. National Fire Danger Rating System (NFDRS) and the Canadian Forest Fire Danger Rating System from weather climatology data. It can be used to calculate fire danger rating indices and components and summarize both fire and weather data. The program can display data, compute values, and statistically analyze data in graph or report form. FFP can summarize weather climatology to produce climatological breakpoints for fire management decision making. It generates the Fire Danger Rating Pocket Cards required by the 30-Mile Abatement Plan and supports Predictive Services' functions at all Geographic Coordination Centers.

FireFamilyPlus 4.1 was officially released in June 2013 after acceptance by both the U.S. Forest Service and Bureau of Land Management Change Management Boards. One of the most significant functional elements of the update is alignment of NFDRS processing with recent changes in the Weather Information Management System (WIMS) that virtually eliminates missing observations and supports a new data transfer format (FW13) that includes solar radiation, wind gust, and snow flag fields.

In 2014, moderate progress was made on the next release version based on suggestions from various users and workshops at Intermediate National Fire Danger Rating System (S-491) training. Release of Version 4.2 is anticipated in spring of 2015.

Contact: Larry Bradshaw
Contract Programmer: Systems for Environmental Management
Status: Ongoing

Figure: The U.S. National Fire Danger Rating System (NFDRS) is a system that allows fire managers to estimate fire danger for a given area. Photo courtesy of the U.S. Forest Service.

First Order Fire Effects Model (FOFEM)

The First Order Fire Effects Model (FOFEM) is a computer program developed to meet the needs of resource managers, planners, and analysts for predicting and planning fire effects. FOFEM simulates four basic effects: 1) consumption of surface and ground fuels and the resultant fire intensity over time using the BurnUp model; 2) emissions and emission rate; 3) soil heating across a range of soil depths over time since ignition; and 4) tree mortality from surface fire, based on flame length or scorch height, and tree species and size.

In 2014, FOFEM development tasks include updated emissions factors for criteria pollutants, new emission factors for numerous other smoke components not currently estimated, an updated soil heating model, a new import feature for FEAT-FIREMON Integrated (FFI) fuels and tree data, and updates to the default fuelbeds. The release of FOFEM 6.3 is anticipated in early 2015.

Contact: Duncan Lutes
Collaborator: Larry Gangi
Status: Ongoing

FuelCalc

FuelCalc is designed to help managers assess changes in ground, surface, and canopy fuel loading as simulated thinning, pruning, piling and prescribed fire treatments are applied. Initial fuel loading can be entered manually or using files exported from FEAT-FIREMON Integrated (FFI). Outputs include canopy fuels (canopy bulk density and crown base height), load of surface and ground fuels, emissions, and fire behavior fuel model.

Recent developments include an updated batch processing tool, updated FFI import utility, and more flexible options for creating treatment and thinning priority. The next FuelCalc release is expected in spring 2015.

Contact: Duncan Lutes
Collaborator: Larry Gangi
Status: Ongoing

Figure: FOFEM can help determine tree mortality as a result of fire. Photo courtesy of the U.S. Forest Service Climate Change Resource Center.

Maintenance and Enhancement

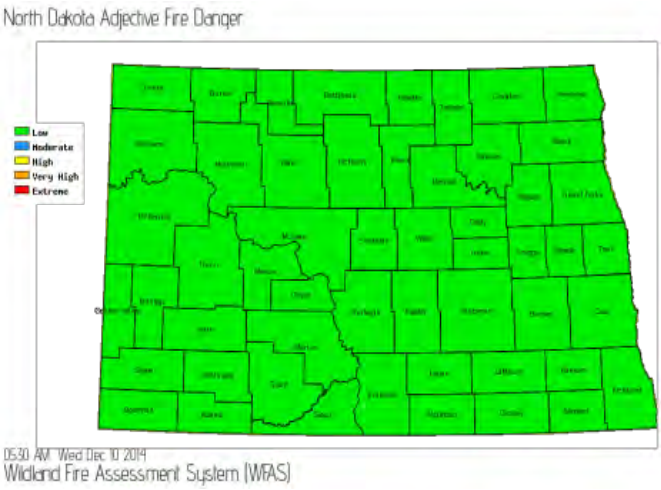
U.S. National Fire Danger Rating System (NFDRS)

The U.S. National Fire Danger Rating System (NFDRS) is a system used by wildland fire management agencies to assess current fire danger at local, regional, and national levels. It consists of a variety of indices that portray current potential fire danger conditions. FMI staff have been highly involved in the development and application of NFDRS for decades. In 2014, they continued to develop and enhance the base fire danger model and the distribution platforms that make fire danger information available to fire managers.

The Wildland Fire Assessment System (WFAS) is an integrated, web-based resource to support fire management decisions. It serves as the primary distribution platform for spatial fire danger data to a nationwide user base of federal, state, and local land managers. This web-based platform saw over 41,100 users with nearly 200,000 page views during 2014. The system provides multi-temporal and multi-spatial views of fire weather and fire potential, including fuel moistures and fire danger classes from the NFDRS, as well as Keetch-Byram and Palmer drought indices, lower atmospheric stability indicators, and satellite-derived vegetation conditions. It also provides fire potential forecasts from 24 hours to 30 days.

WFAS developers, working closely with Federal fire managers from the U.S. Forest Service and the National Park Service and fire weather forecasters from the Bismarck Weather Forecast Office of the National Weather Service, created an automated fire danger distribution system for the state of North Dakota. This system leverages established fire danger calculations from weather stations state-wide to provide daily assessments of fire danger to local, state, and federal agencies. This partnership was forged over the last two years and the system became operational in January 2014.

Fire danger maps are produced daily for the state of North Dakota along with text products that indicate the fire danger by county. In the coming



Figures: Static county-based fire danger map for North Dakota (left) and dynamic fire danger Google Earth overlay (right) for early December 2014. These maps are produced daily as part of the North Dakota fire danger rating system prototype.

year, this system will be expanded to include South Dakota and eventually it will encompass the entire Great Plains.

In 2014, WFAS developers worked closely with researchers from the University of Idaho, the University of Montana, and U.S. Forest Service Region 1 to develop the TOPOFIRE web display and analysis system (http://topofire.dbs.umt.edu) for processing and displaying spatial weather data that can be used to support the development of the next generation of NFDRS and WFAS. The system is a NASA Earth Sciences Applications-supported project aimed at streamlining the development and use of spatial data for wildland fire decision making. The system will provide access to a wealth of high-resolution spatial weather data that will significantly enhance WFAS products. NASA saw the value in the project and will continue funding further development and refinement of the system over the next three years.

Development of a new tool to combine airborne and spaceborne laser scanner data with passive remote sensing-derived canopy fuel products from LANDIFRE is underway. This new tool is being developed in collaboration with the U.S. Geological Survey Earth Resources Observation and Science Center and will provide rapid integration of highly detailed LiDAR into fuels maps used for fire behavior predictions. Called CHISLIC (Creating Hybrid Structure from LANDFIRE/Lidar Combinations), it will function as a desktop tool that derives its spatial data from web data services provided by WFAS.

WFAS developers in FMI have been producing seven-day fire danger forecasts from the National Weather Service's National Digital Forecast Database (NDFD) for several years (http://www.wfas.net/). WFAS developers continued to work closely with Predictive Services' meteorologists throughout the country in 2014 to provide point forecasts for key Remote Automated Weather Stations (RAWS) located throughout the United States. WFAS now produces seven-day outlooks daily for more than 1,000 weather station points. These outlooks are being used operationally to produce seven-day fire potential forecasts for every geographic area in the continental United States. These seven-day forecasts provide a much longer fire danger outlook than was previously available and are providing fire managers with tools to meet strategic planning needs.

WFAS developers in FMI have also designed and implemented a state-of-the-art web mapping interface for the display and analysis of remotely sensed spatial fire potential data. This new interface allows the rapid assessment of fuel conditions across a landscape and provides managers with several tools to assess fuel changes over time. The system is built on a suite of open-source tools that provides a means for efficient storage, display, and analysis of large spatial datasets. This new framework will be a building block for a new, integrated fire danger display and analysis system. The new interface complements the existing static LANDFIRE national maps and will provide more system flexibility by allowing users to define their own area of interest, link to weather station data in a tabular format, and search for map features. The prototype for the interactive map can be accessed at http://maps.wfas.net/. This web mapping and analysis interface will provide the tools necessary for the rapid and effective dissemination of large spatial datasets to the fire management community and will ultimately serve as the development platform for the next generation of fire danger rating systems.

In 2014, RMRS fire danger rating system developers sought and gained approval to update the U.S. National Fire Danger Rating System. This system has remained static for nearly 40 years,

Maintenance and Enhancement

despite many scientific and technological advances that could significantly improve the system. These system updates have been approved by the Fire Danger Subcommittee of the National Wildfire Coordinating Group (NWCG) and by the NWCG Executive Board. The new system will be implemented and tested over the next two years and is expected to be fully operational in January 2016.

Contacts: W. Matt Jolly, Larry Bradshaw
FMI Staff: W. Matt Jolly, Larry Bradshaw, Faith Ann Heinsch
Collaborators: National Wildfire Coordinating Group's Fire Danger Subcommittee, National Weather Service, Predictive Services

Status: Seven-day fire potential forecasts complete; collaboration with TOPOFIRE project ongoing

Figure: Remote Automatic Weather Stations (RAWS) are strategically located throughout the United States. These stations monitor the weather and provide weather data. This photo of the Ninemile, Montana, RAWS courtesy of the Western Region Climate Center.

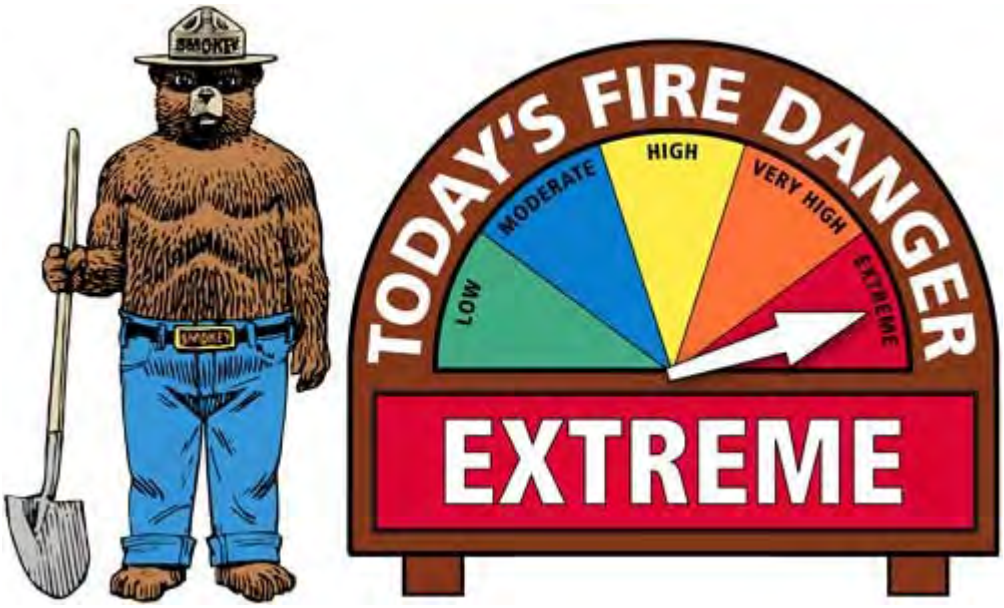
Weather Information Management System (WIMS)

The U.S. National Fire Danger Rating System (NFDRS) is used by all federal and most state fire management agencies for assessing seasonal fire severity across the nation. The application that hosts the NFDRS is the Washington Office Fire and Aviation Management's (WO F&AM) Weather Information Management System (WIMS) located at the USDA National Information Technology Center in Kansas City, Missouri. WIMS ingests hourly weather observations from Remote Automated Weather Stations (RAWS) located across the continental United States, Alaska, Hawaii, and Puerto Rico.

FMI staff worked with the NWCG Fire Environment's Fire Danger Subcommittee to present a proposal to the NWCG Executive Committee for a major update to NFDRS: NFDRS 2016. The proposal was adopted and FMI staff are leading the science and technical implementation in WIMS. They also collaborated with WO F&AM program managers and contractors to:

- Implement the Growing Season Index in the WIMS test environment. Developed by FMI staff scientist, W. Matt Jolly, it will replace the current NFDRS live fuel moisture model in 2016.
- Implement a seven-day forecasting scheme in the National Weather Service for forecasting NFDRS indices in WIMS. Scheduled to go into production in January 2015, this replaces the next-day forecasting process that has served NFDRS for 40 years.
- Implement the new FW13 data exchange format into the Kansas City Fire Access Software (KCFAST) and Fire and Weather Data web applications. Last year the FW13 format was implemented in WIMS, FireFamilyPlus, and the long-term repository of hourly RAWS data at the Western Region Climate Center.

Contacts: Larry Bradshaw, W. Matt Jolly
FMI Staff: W. Matt Jolly, Faith Ann Heinsch
Collaborators: Predictive Services, National Wildfire Coordinating Group's Fire Danger Subcommittee, National Weather Service
Status: Ongoing



Support

The Fire Modeling Institute provides support for management in the application of fire science, including physical fire processes, fuel dynamics, smoke emissions and dispersion, fire ecology, and fire and fuels management strategies. FMI provides several kinds of support: application support, field support, and information services.

Application Support

The Application and Modeling Teams provide phone and email support for products developed by the Fire, Fuel, and Smoke Science Program.

An agreement between Washington Office Fire and Aviation Management (WO F&AM) and FMI ensures FMI staff are available to assist the National Fire Applications Help Desk in answering questions regarding BehavePlus, FARSITE, FlamMap, FireFamilyPlus, Weather Information Management System (WIMS), and Wildland Fire Assessment System (WFAS) operations. In 2014, FMI staff responded to the following technical support contacts:

- BehavePlus: >20
- FARSITE: 5
- FlamMap: 7
- FireFamilyPlus: >45
- WIMS: 113
- WFAS: >45

FEAT-FIREMON Integrated (FFI) technical support is accomplished through the FFI Google discussion group, email, and phone "help desk". The FFI technical support lead for FMI recorded >100 technical support contacts in 2014.

Contact: Kristine Lee
FMI Staff: Ilana Abrahamson, Larry Bradshaw, Janet Fryer, Faith Ann Heinsch, Robin Innes, W. Matt Jolly, Duncan Lutes, Charles McHugh, Jane Kapler Smith, Kris Zouhar
Collaborators: Washington Office Fire and Aviation Management
Status: Ongoing

Figure: Information about the applications and products mentioned in this report can be found at the Fire, Fuel, and Smoke Science Program's new website, http://www.firelab.org/, under Apps & Products.

Field Support

The Modeling Team provides fire behavior monitoring, fire behavior forecasts, weather forecasts, and long-term assessments for fire managers and incident management teams throughout the nation.

National Fire Incident Support

FMI staff provides fuels and fire behavior modeling, operations, and planning support during wildfire incidents occurring throughout the nation. In 2014, FMI staff worked nearly 880 hours with incident management teams in support of wildfire incidents in the U.S. Forest Service National Forest System, including the Northern Region (Region 1), Pacific Southwest Region (Region 5), and Pacific Northwest Region (Region 6).

While the tenure of any incident management team is short, a Long Term Implementation Plan is prepared to last through the life of any given fire as long as the plan receives timely updates. Each long term plan is unique as they are driven by the specific questions asked by the local unit and how that fire is being managed. The long term plan is intended to provide guiding information for the local unit managing the fire and often allows for organizational flexibility based on fire behavior, proximity to identified values, and weather.

Several FMI staff members assisted with long-term implementation plans during 2014. Fire Analyst LaWen Hollingsworth assisted in developing three long-term plans this last fire season for Lone Mountain 1 Fire on the North Cascades National Park, Eagle Cap Wilderness Fires on the Wallowa-Whitman National Forest, and the Seepay Fire on the Flathead Indian Reservation.

Fire Spatial Analyst Charles McHugh also assisted in developing three long-term plans this past fire season. These included the Rain Complex on the Nez Perce-Clearwater National Forests, the Deception Complex on the Willamette National Forest, and the Madison Fire on the Beaverhead-

Figure: The Carlton Complex Fire on the Okanogan-Wenatchee National Forest, Washington, was one of the many fires that FMI staff provided support for during 2014. Photo courtesy of Faith Ann Heinsch.

Support

Deerlodge National Forest. The level of complexity varied for each assessment with the work on the Deception Complex being the most involved. In addition, McHugh provided numerous gridded winds analyses using the WindWizard model for fires in Regions 1, 5, and 6, and he participated in a review of fuel treatment effectiveness for the recent Funny Fire on the Kenai National Wildlife Refuge in Alaska. He worked with refuge managers and U.S. Fish and Wildlife Service regional fire staff to discuss how to analyze and present an analysis of treatment effectiveness during fire suppression operations.

Contact: Kristine Lee
FMI Staff: Faith Ann Heinsch, LaWen Hollingsworth, W. Matt Jolly, Charles McHugh

Status: Ongoing

Risk Assessment for the Mission Mountain Wilderness

Fire Spatial Analyst Charles McHugh worked with Fire Application Specialist Erin Noonan-Wright with Wildland Fire Management Research, Development, and Application (WFM RD&A) in the development of a risk assessment for a large-scale prescribed fire in the Mission Mountain Wilderness on the Swan Ranger District of the Flathead National Forest. They provided fire behavior and wind modeling information to predict fire behavior and spotting potential for the fire. They also provided information on seasonal severity (current season's drought potential, precipitation amount and duration, fuel moistures, and season-end date). The prescribed fire was important to provide a buffer to future naturally ignited wildland fires in the Mission Mountains for the community of Condon, Montana.

Contact: Charles McHugh
Collaborator: Erin Noonan-Wright (WFM RD&A)
Status: Complete

Revisions of Forest Plans

The 2012 Planning Rule clearly emphasizes the importance of engaging research in the process of revising Forest Plans. In 2014, Fire Analyst LaWen Hollingsworth assisted in the Assessment phase of forest plan revision for the Helena National Forest and the Lewis and Clark National Forest in the Northern Region (Region 1) as an ad hoc member tasked with fuels and air quality. Hollingsworth worked as a filter, reaching out to other scientists at RMRS to include reviews of reports and the best possible science. W. Matt Jolly, along with several RMRS scientists, assisted with the assessment of the Nez Perce-Clearwater National Forests' Forest Plan.

Contact: Kristine Lee

Figure: The Lone Mountain 1 Fire in North Cascades National Park. Photo courtesy of LaWen Hollingsworth.

FMI Staff: LaWen Hollingsworth, W. Matt Jolly
Status: Ongoing

Collaborative Forest Landscape Restoration Program (CFLRP)

Fire Analyst LaWen Hollingsworth continues to provide technical overview and analyst support for the Southwestern Crown of the Continent (SWCC) in Montana. The conclusion of fiscal year 2014 coincided with mid-project reporting for various metrics within the CFLRP. Hollingsworth has assisted in comparing baseline fire behavior at the start of the project in 2010 with conditions in 2014 to determine whether ecological indicator metrics as developed by the SWCC were satisfied. She also helped with analyses that compare conditions in 2010 with predicted conditions at the conclusion of fiscal year 2019. Analyses include treatments already implemented and treatments proposed for implementation.

Contact: LaWen Hollingsworth
Collaborators: SWCC Vegetation Group, National Fire Decision Support Center (Matt Thompson and Jessica Haas), and the Western Wildland Environmental Threat Assessment Center (Nicole Vaillant).
Status: Ongoing

Geospatial Analysis Services

On an ongoing basis, GIS Specialist Eva Karau fills requests that range from simple maps or graphics to complex spatial and tabular analyses. Some examples from 2014 include:

- Maps and summaries of EPA Non-Attainment Areas for possible new Ozone Standards for WO FAM.
- Consultation regarding appropriate use of LANDFIRE data to distinguish forested and non-forested land for Region 4.
- Geospatial summaries of fire probabilities within ecological response units in Forest Service Southwestern Region.
- Map of whitebark pine blister rust infection for USFS Region 1.
- Geospatial analysis of fires in sage-grouse habitat for WO FAM.

Contact: Eva Karau
Collaborators: Laurie Kurth, Jim Menakis and Pete Lahm (WO Fire and Aviation Management), Robert Keane (Rocky Mountain Research Station), Michael Hand (Rocky Mountain Research Station), Mary Frances Mahalovich (USFS Regional Genetics), Sue Stewart (USFS Region 4)
Status: Ongoing

Support

Information Services

Support for the Fire Effects Information System is accomplished through the FEIS website, http://www.feis-crs.org/beta/. The Information Team received approximately 20 contacts in 2014.

Contact: Jane Kapler Smith
FMI Staff: Ilana Abrahamson, Janet Fryer, Robin Innes, Jane Kapler Smith, Kris Zouhar
Collaborators: National Wildfire Coordinating Group's Fuels Management Committee, FMI-LANDFIRE, The Nature Conservancy-LANDFIRE, U.S. Forest Service Digital Enterprise Team, National Center for Landscape Fire Analysis
Status: Ongoing

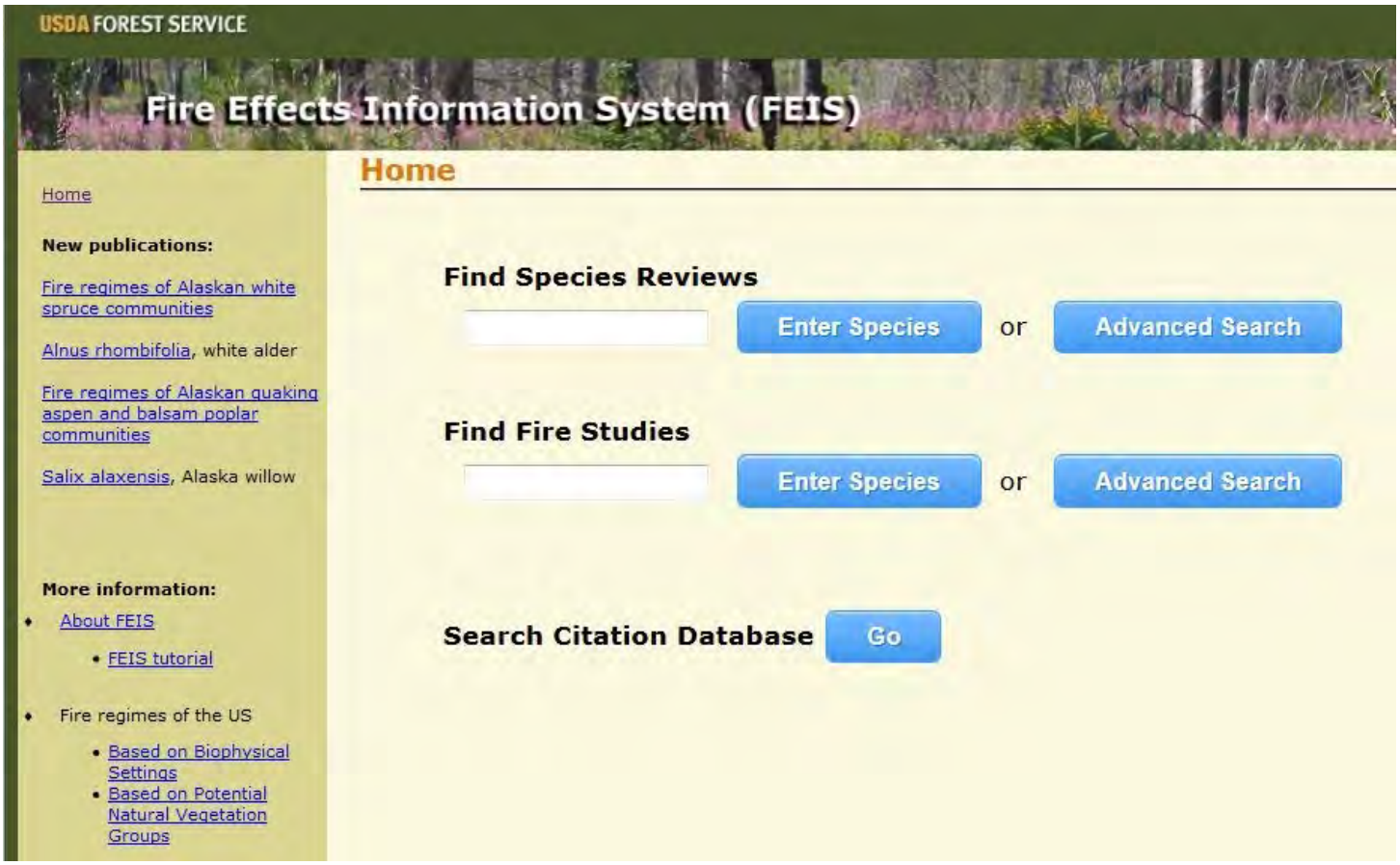


Figure: The Fire Effects Information System (FEIS) is an online collection of reviews of the scientific literature about fire effects on plants and animals and about fire regimes of plant communities in the United States. FEIS reviews are based on thorough literature searches, often supplemented with insights from field scientists and managers.

Training and Education

FMI contributes to educational course development and training in support of interagency fire managers. FMI supports this task by instructing National Wildlife Coordinating Group (NWCG) courses and providing training on FFS applications and products. FMI also strives to improve science communication with fire managers and the public with assistance from the FFS Conservation Education Program.

Application Training

FMI staff provided instruction in the following FFS applications and products during 2014:

BehavePlus

FMI staff led several classroom and online training sessions on the BehavePlus fire modeling system in 2014. Approximately 50 participants from a variety of government agencies and universities participated in these sessions. Physical Scientist Faith Ann Heinsch and Fire Analyst LaWen Hollingsworth presented at a pre-course workshop in southwestern Montana to prepare 11 students for the Advanced Fire Behavior Calculations (S-490) course, in which BehavePlus is extensively used. Materials from this workshop have been shared with a number of interested people around the United States to assist with local BehavePlus training. Heinsch and Hollingsworth, along with Fire Spatial Analyst Greg Dillon, presented an Introduction to BehavePlus workshop at the Large Fire Conference in Missoula, Montana, in May. In addition, W. Matt Jolly, Heinsch, and Hollingsworth presented a workshop at the conference on using BehavePlus in prescribed fire planning.

FARSITE and FlamMap

Fire Spatial Analyst Charles McHugh gave an invited presentation to the National Wildfire Coordinating Group's (NWCG) Fire Behavior Committee on the future development and support of FARSITE and FlamMap and how these applications fit into the overall fire management and analysis program.

FEAT-FIREMON Integrated (FFI)

Ecologist Duncan Lutes taught five FFI training classes throughout the year. In the standard class, students learned FFI basics such as data hierarchy, database management, species management, data entry, and report creation. The advanced classes focused on more in-depth analysis of users' data, including custom reports, statistical analysis, and data queries. A workshop demonstrating the capabilities of the FFI application was also presented at the Large Fire Conference in Missoula, Montana. In total, 70 participants attended the classes.

Fire Effects Information System (FEIS)

Each year the Information Team staff provide instruction on the use of FEIS in the National Wildfire Coordinating Group's (NWCG) Introduction to Fire Effects (Rx-310) course. This year, Ecologist Kris Zouhar taught the class, featuring FEIS's new search capabilities. She also taught a course on fire and invasive weeds, featuring content from FEIS, in the Advanced Fire Effects (Rx-510) course. In February, Ecologist Ilana Abrahamson gave a presentation on FEIS to

Training and Education

nearly 40 University of Montana students, and in April, Ecologist Janet Fryer gave a presentation on FEIS to 20 University of Idaho students. Abrahamson and Ecologist Jane Kapler Smith also presented on FEIS at a workshop at the Large Fire Conference in Missoula, Montana, in May.

FireFamilyPlus

FireFamilyPlus is the computational and analysis cornerstone for the biennial Advanced Fire Danger Rating course at the National Advanced Fire and Resource Institute (NAFRI) and the annual Intermediate Fire Danger Rating (S-491) courses help by various Geographic Area Training Centers throughout the country. It also provides climate summaries for techniques taught in the Long Term Fire Risk Assessment (S-495) course at NAFRI. Meteorologist Larry Bradshaw, Physical Scientist Faith Ann Heinsch, and Ecologist W. Matt Jolly taught S-491 at the Northern Rockies Training Center in Missoula, Montana, in February, and Bradshaw and Heinsch taught it at the Great Basin Training Center in Boise, Idaho, in March.

FOFEM & FuelCalc

Ecologist Duncan Lutes presented on FOFEM and FuelCalc in a workshop at the Large Fire Conference in Missoula, Montana, in May.

Weather Information Management System (WIMS)

Meteorologist Larry Bradshaw taught a WIMS training course in April at the Western Fire Training Center in California.

Figure: FEAT-FIREMON Integrated (FFI) web training class at the George Washington and Jefferson National Forests. Photo courtesy of Marek Smith, The Nature Conservancy.

National Wildfire Coordinating Group (NWCG) Courses

FMI staff instruct several NWCG courses. Many of these are prerequisites for NWCG position task books required by the Wildland Fire Qualification System. These courses include the following:

- RX-310 Introduction to Fire Effects
- RX-510 Advanced Fire Effects
- S-390 Introduction to Wildland Fire Behavior Calculations
- S-490 Advanced Wildland Fire Behavior Calculations
- S-495 Geospatial Fire Analysis, Interpretation, and Application
- S-590 Advanced Fire Behavior Interpretation

For more information about these courses, visit the NWCG Training and Qualifications website (http://training.nwcg.gov/).

Other Training

Prescribed fire

Physical Scientist Faith Ann Heinsch and Fire Analyst LaWen Hollingsworth gave a presentation to the Northeastern Area Association of State Foresters about fire behavior systems and training provided by FMI and discussed assessing prescribed fire training needs in the Northeast.

Climate Change

Physical Scientist Faith Ann Heinsch gave two presentations on climate change during 2014. In November, Heinsch gave the keynote presentation on "Climate Change, Climate Variability, and Ecosystem Response in the Western U.S." to more than 300 attendees of the Backyards and Beyond Wildland Fire Education Conference in Salt Lake City, Utah. She also gave a guest lecture at the University of Montana titled "Climate Change and Wildland Fire in the Northern Rockies" during a Climate Change: Science and Society course.

Fire Behavior in Beetle-Killed Stands

In 2014, Fire Spatial Analyst Charles McHugh gave an invited presentation on fire behavior in spruce bark beetle-killed stands at the Spruce Beetle Epidemic and Aspen Decline Management Response (SBEADMR) Science Workshop in Montrose, Colorado. The workshop provided the state of the knowledge on the ecology and management of spruce-fir and aspen ecosystems in the Uncompahgre and Gunnison National Forests, which are experiencing spruce beetle and quaking aspen decline leading to abundant mortality. Participants plan to utilize key findings from the workshop to improve approaches and analysis being completed in a draft Environmental Impact Statement. W. Matt Jolly gave a presentation on fire behavior in mountain pine beetle-killed stands to students of the Advanced Fire Behavior Interpretation (S-590) course titled "Modeling Fire Behavior in Mountain Pine Beetle-Altered Fuels".

Contact: Kristine Lee
FMI Staff: Ilana Abrahamson, Larry Bradshaw, Greg Dillon, Janet Fryer, Faith Ann Heinsch, LaWen Hollingsworth, Robin Innes, W. Matt Jolly, Don Long, Duncan Lutes, Charles McHugh, Jane Kapler Smith, Kris Zouhar
Collaborator: National Wildfire Coordinating Group, WO F&AM
Status: Ongoing

Training and Education

Conservation Education

Wildland fire draws the public's attention every summer, but public understanding of fire is limited. The Missoula Fire Lab provides tours, workshops, presentations, and educational curricula and materials to help increase public understanding of the science of wildland fire. In 2014, the Fire Lab's Conservation Education Program reached more than 1,000 students and 150 adults:

- FMI and FFS staff provided 10 tours for 336 students and 49 teachers and other adults. Tours included hands-on activities, including lab investigations of fire spread and use of feltboards to "tell the stories" of fire's role in Rocky Mountain forests.
- They gave 7 presentations in classrooms and field sites, teaching students at the Elementary and Middle School levels. These presentations addressed 420 students and 25 teachers/faculty.
- They loaned the FireWorks trunk to 8 teachers, who used it to teach more than 300 children.
- They gave presentations to 54 teachers and agency educators in workshops provided by the International Association for Wildland fire, the Lolo National Forest, and the Glacier Institute.

In addition, they hosted two intensive educational workshops in 2014 —a week-long summer camp on natural resources for Middle School students in a program for at-risk children in Missoula County, and a 2-day "FireWorks master class" for professional educators. The 29 students and 3 teachers in the natural resources camp learned about history and fuel reduction projects at Garnet Ghost Town. They visited the National Bison Range, where they learned about the historical and current relationship of the Salish and Kootenai Tribes with the Jocko River. On the Lolo National Forest, they learned about insect and fish ecology. On the final day of the camp, they learned about fire from presentations by the Montana Department of Natural Resources and Conservation, Missoula Rural Fire, Lolo National Forest, and the Missoula Smokejumpers. The day concluded with hands-on learning about fire behavior and fire ecology at the Fire Lab.

Figure: Interpretive tour of Garnet Ghost Town, Montana. Photo by Kristine Lee.

The FireWorks master class offers an in-depth exploration of the 30-plus activities in the FireWorks curriculum and trunk. Sixteen educators from Montana, Idaho, Kansas, and North Carolina participated in the 2014 course. They conducted experiments in the Fire Lab's burn chamber to learn about ignition, heat transfer, and fuel properties. They "adopted" the characters of various plants and animals to teach each other about different organisms' adaptations to fire. They participated in role-playing to "model" tree morphology, trees' responses to fires of varying severities, and ecological succession in different kinds of forest. Participants from Kansas and North Carolina plan to use the workshop as a springboard for adapting the FireWorks curriculum to teach about fire science in their geographic areas.

Contact: Jane Kapler Smith

FMI and FFS Collaborators: Ilana Abrahamson, Greg Dillon, Janet Fryer, Faith Ann Heinsch, Robin Innes, Helen Smith, Eva Karau, Kristine Lee, Emily Heyerdahl, Sean Urbanski, Mark Finney, Sarah McAllister, and others
Status: Ongoing

Figure: Teachers at the 2-day FireWorks master class test their model tree to see if it can survive a surface fire. Photo by Audrey Peterson. Signed publication permissions on file .

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